

## **ANALYTE DETECTION IN LIQUIDS WITH CARBON NANOTUBE FIELD EFFECT TRANSMISSION DEVICES**

### **ABSTRACT OF THE DISCLOSURE**

Field-effect transistor (FET) devices with carbon nanotubes as the conducting  
5 channel detect chemicals in liquids are described. Chemical detection occurs primarily  
through analysis of conduction ( $I$ ) as a function of the applied gate voltage ( $V_g$ ). The  
conductivity of liquids is an important variable in the analysis of measurements of the  
device performance. In high-conducting liquids, screening and liquid conductance  
dominate in the device measurements; in low-conductive liquids (e.g., cyclohexane), the  
10 changes in the NTFET device performance upon exposure to different chemicals are  
similar to those found for the performance of the device in a gaseous environment. The  
influence of aromatic compounds on the device electronics can be correlated with their  
relative ability to donate or withdraw electrons from the carbon nanotube. A shift in the  
threshold of  $I$ - $V_g$  was found to be linear with Hammett sigma values ( $\sigma_p$ ) for mono-  
15 substituted benzene compounds.